Materia kwarkowa, materia dziwna i gwiazdy dziwne

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IFD UW 16 I 2004

- **Materia dziwna (strange matter)** - pojęcie, hipoteza
- Materia dziwna - Model Worka MIT, **strangelets**
- Powstawanie gwiazd dziwnych ???
- **Gwiazdy dziwne (strange stars)**: nagie a także okryte skorupą
- Pamiętny 10 kwietnia 2002: najbliższa gwiazda neutronowa to gwiazda dziwna ???
- Gwiazdy dziwne we Wszechświecie ??? - argumenty za i przeciw
- Konkluzja (tymczasowa i subiektywna)

Scenarios of formation of strange stars ?

- **strangelets** - leftover of hadronization epoch, microseconds after Big Bang (*Witten 1984*). Unfortunately: complete evaporation into nucleons before cooling. Color-Flavor-Lock Superconductivity with $\Delta \sim 100\ MeV$ could greatly help?

- a strangelet hits NS $\equiv$ seed of SM $\Longrightarrow$ neutron absorption $\Longrightarrow$ NS$\longrightarrow$SS in $milliseconds - seconds$ *Olinto 1987*

- coalescence in NS-NS binaries: $k_{\rm B}T \sim 60 MeV$, huge compression $\Longrightarrow$ seed of SM by thermal fluctuation $\Longrightarrow$ formation of rapidly rotating SS accompanied by a short γ-ray burst (*Haensel, Paczyński, Amsterdamski 1991*)

- accretion onto NS in a close binary system. Seed of SM at the center $\Longrightarrow$ NS$\longrightarrow$SS in a fraction of second (*Cheng 1994*)

- . . . .

Some arguments FOR and AGAINST existence of SS

Contra - SS

- Glitching pulsars with macroglitches ($\Delta\Omega/\Omega \sim 10^{-6}$) cannot be SS - for example, condition $I_{\rm crust}/I > 1\%$ is violated for SS

- Strangelets in the Galaxy - no way - they would transform practically all NS into SS (???)

- If a SS collides with a NS or SS $\Longrightarrow$ swarm of strangelets ejected into Galaxy $\Longrightarrow$ see above ...

Pro- SS

- Some compact stars seem to have $R_\infty < 12\ km$ (in several X-ray sources), but systematic errors too large to be really sure.

- Submillisecond pulsars (*Glendenning 1989* - ephemeral SN1987A ...)... if they only existed, then maybe ...but even then - only those spun-up by accretion (*Gondek,Haensel,Gourgoulhon 2002*)

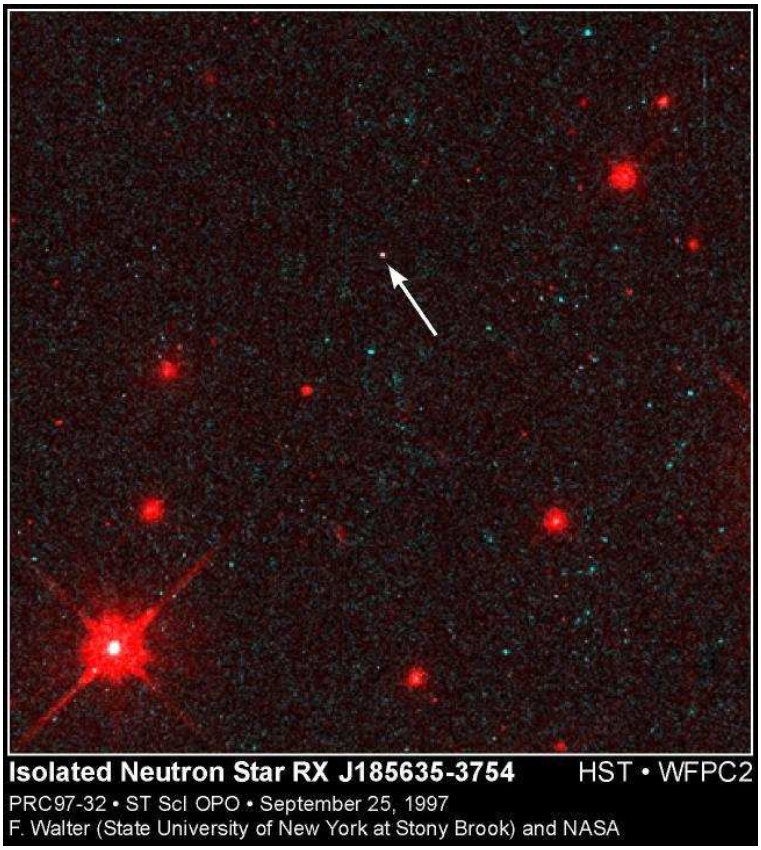

Figure 1: **Visual light picture of lonely close by neutron star RX 1856-37 by Hubble Space Telescope**

Les Philosophes qui font des systèmes sur la secrète construction de l'univers, sont comme nos voyageurs qui vont à Constantinople, et qui parlent du Sérail: Ils n'en n'ont vu que les dehors, et ils prétendent savoir ce que fait le Sultan avec ses Favorites.

Voltaire, in *Pensées Philosophiques*, 1766.

Figure 2: **X-ray view of RX 1856-37 by AXAF Chandra (April 2002)**